Environmental Engineering Research Program Capabilities & Research

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UNIVERSITY OF THE PACIFIC
ECOLOGICAL ENGINEERING RESEARCH PROGRAM

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Outline

- Introduction
  - Ecological Engineering Research Program (EERP)
    - The University of the Pacific
  - Facilities & organization
  - Research focus & experience
- DO TMDL Project
- EERP & CV-SALTS

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Ecological Engineering RP

- Established 2004 at University of the Pacific
  - School of Engineering & Computer Science
  - Stockton, CA
- Research focus
  - Water quality & sustainable agriculture
    - Diffuse pollution impacts & measurement
    - Use of natural systems for water quality control
- Externally funded
  - $ 1.1 million per year target

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EERP Structure

- Scientific Staff
  - Director
  - Staff Scientists
  - Post-Doctoral Scientists
- Students
  - Co-op program
  - Student assistants
  - Visiting scholars
- Technical Staff
  - Laboratory Technicians
  - Field Technicians
  - Data Technicians
  - Administrative Assistant
- Collaborating Faculty
  - Engineering
  - Biology
  - Pharmacy
  - Natural Resources Institute

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EERP Collaborators

- US Geological Survey
- US Fish & Wildlife Service
- California Department of Fish & Game
- University of California
- Berkeley National Laboratory
- California Department of Water Resources
- SJ Valley Drainage Authority
- SJ River Group Authority
- Turku University (Finland)
- Clarkson University (New York)

EERP Resources

- **Water Quality Research Laboratory**
  - Gas chromatograph-mass spectrometer
  - Fluorometer & spectrophotometer
  - Total organic carbon analyzer
  - Total nitrogen analyzer

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EERP Resources

- Field Research Capabilities
  - Support to project collaborators
  - State of art field equipment
  - Sampling van
  - Sampling boat

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EERP Resources

- Technical Training Facility

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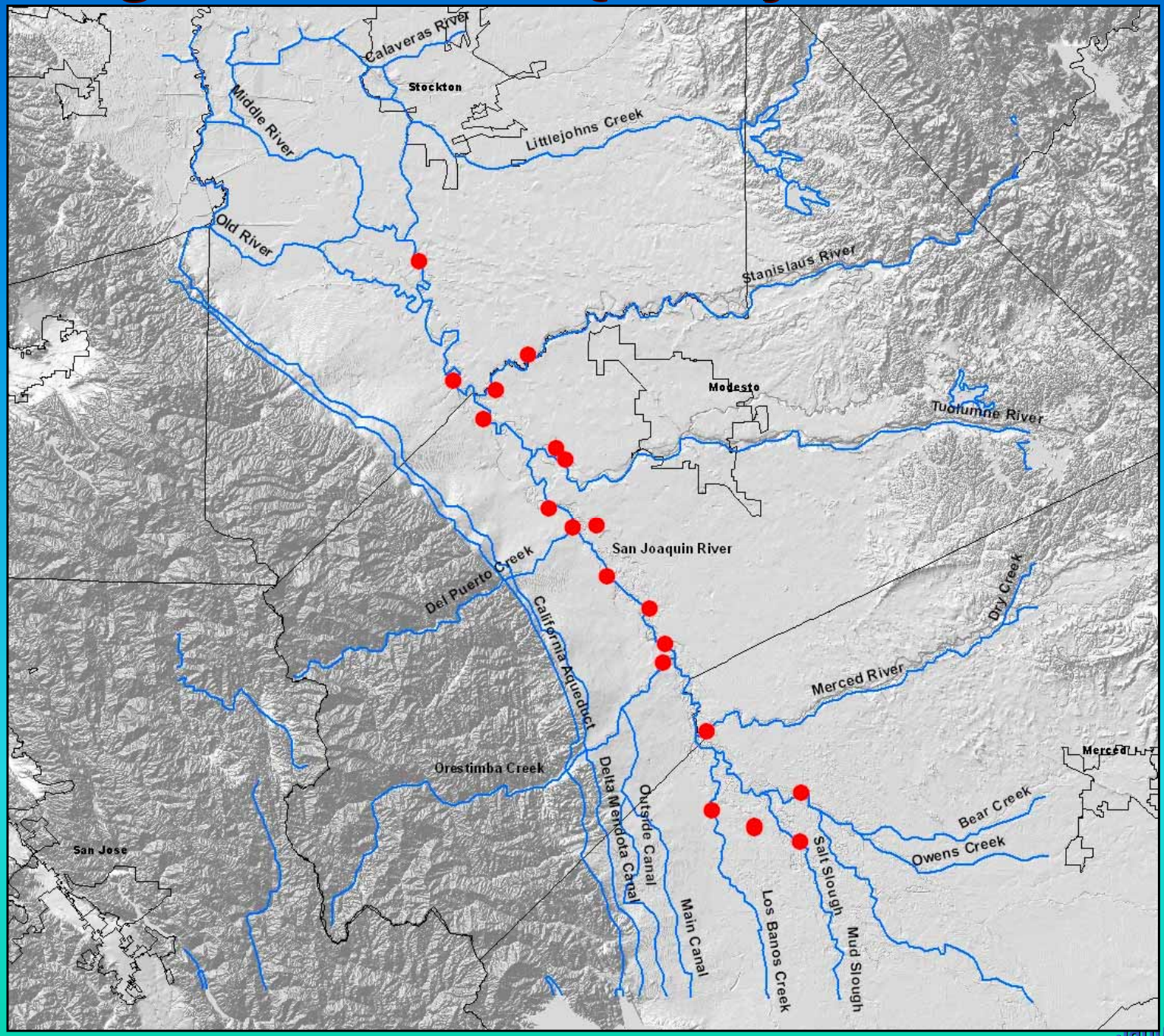
Regional Water Quality Network



EERP Projects 2004 - 2008

- San Joaquin River DO TMDL Project
  - Mass balance on SJR to support river restoration
- San Luis National Wildlife Refuge TOC Project
  - Impact of refuge management practices on water quality
- Western Stanislaus Co. BMP Project
  - Investigate efficacy of current best management practices
- Riparian Zone Project
  - Investigate effects of riparian wetlands on water quality
- VAMP 2008
  - Water quality study

EERP Accomplishments

- Nationally recognized water quality research program
- Scientific research on critical regional & national water quality issues
- Provide scientific support to local, regional, & national water/environmental agencies
- Training & education in water quality & ecological engineering

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DO TMDL Project

- EERP lead scientific agency
  - Eleven organizations: Federal, State, Private
- Installed or improved 20 flow stations
- Managed 18 stations directly
- Collected WQ or flow data at 188 locations
- Over 2,000 events of WQ data collection
  - Up to 71 biological, chemical, & physical parameters each event
- Over 8,000,000 lines of continuous monitoring data collected (flow & WQ)

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DO TMDL Project

- Collection of regional flow and water quality data
  - Maintained 18 flow monitoring stations directly
    - Currently 11 still on maintenance schedule
  - Established QA/QC program on flow, specific conductance (EC), and water quality
  - Compiled & published flow & water quality data from multiple sources
  - Provide tech support to cooperating organizations

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DO TMDL Project

- **Scientific interpretation**
  - **Spatial & temporal analysis**
    - **Not normal data**
  - **Model validation**
    - **WARMF-SJR**

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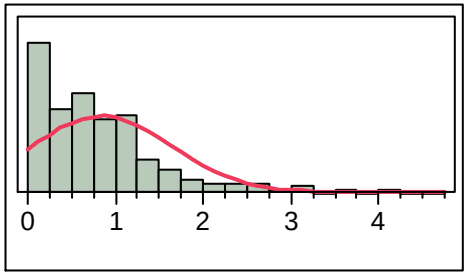
Data Table=DO TMDL Data,Notes=C:\Projects\SJR Projects\Current Analysis WTS\Wilcoxon Analysis\Tribsonly 2008 final data\TribsOnly_041708.xls

Distributions

Spec Cond mS/cm



Normal(0.84489,0.79453)

Fitted Normal

Parameter Estimates

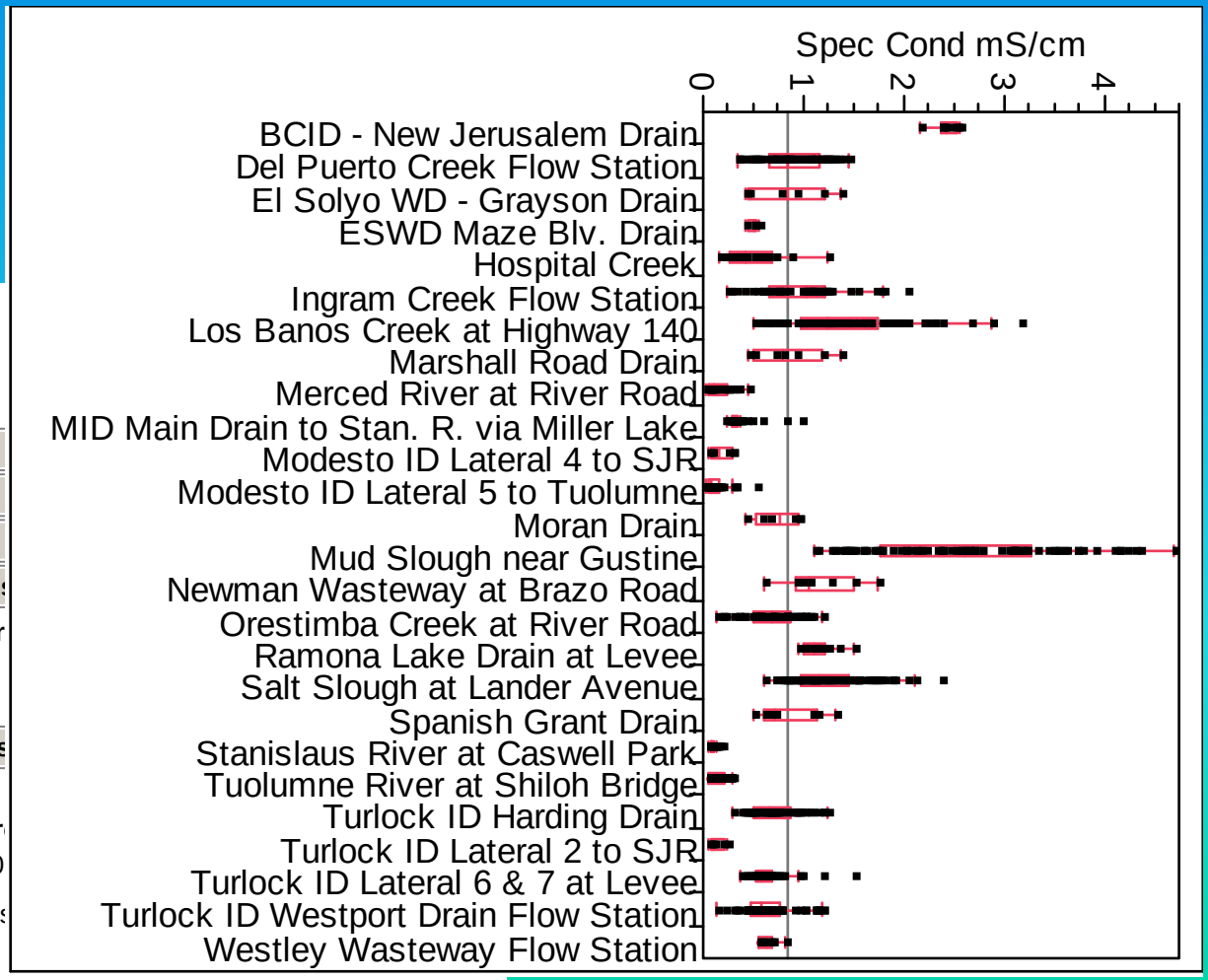
Type	Parameter
Location	μ
Dispersion	s

Goodness-of-Fit Tes

Shapiro-Wilk W Test

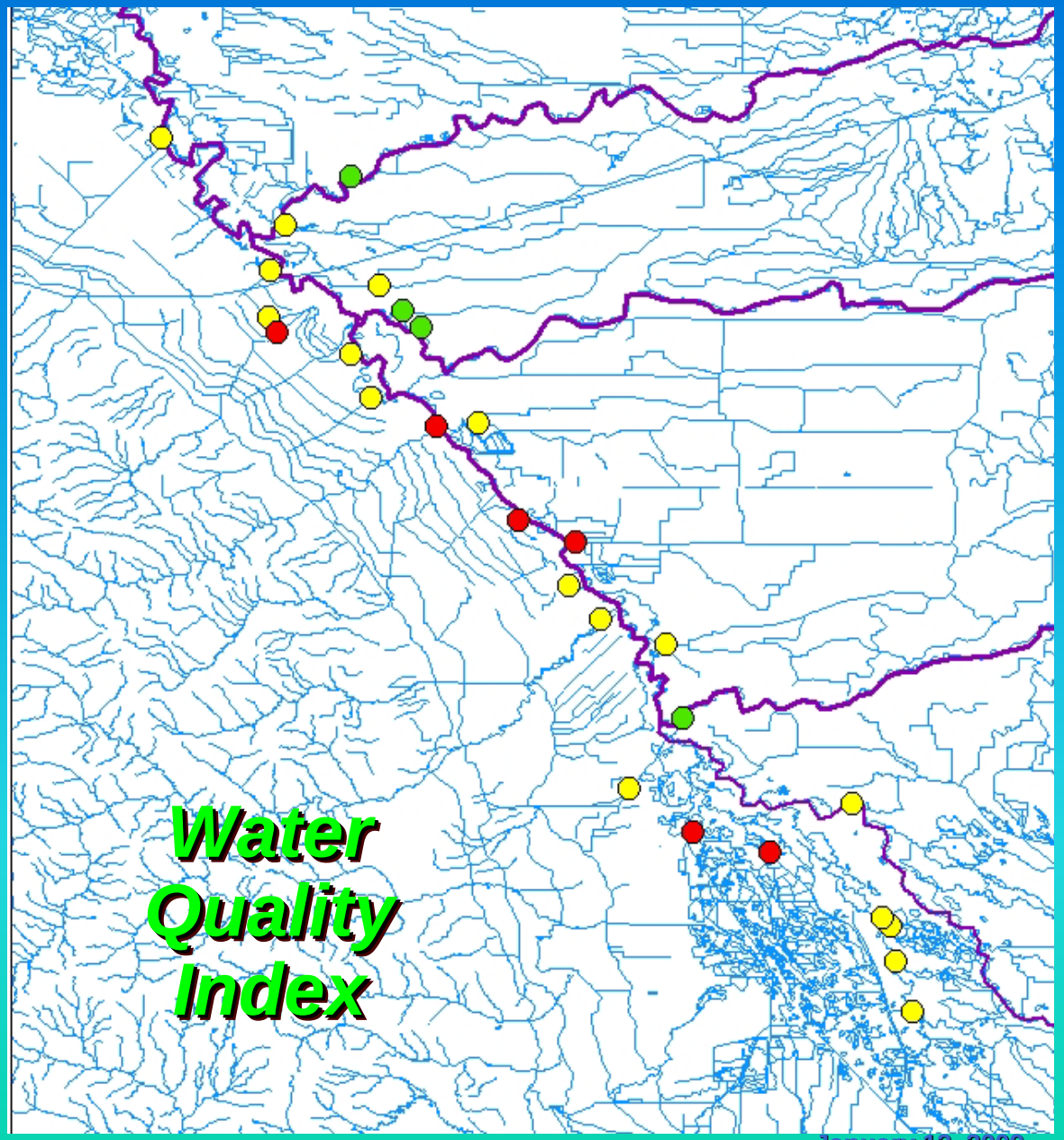
W	Pr
0.831023	0

Note: Ho = The data is
p-values reject Ho.



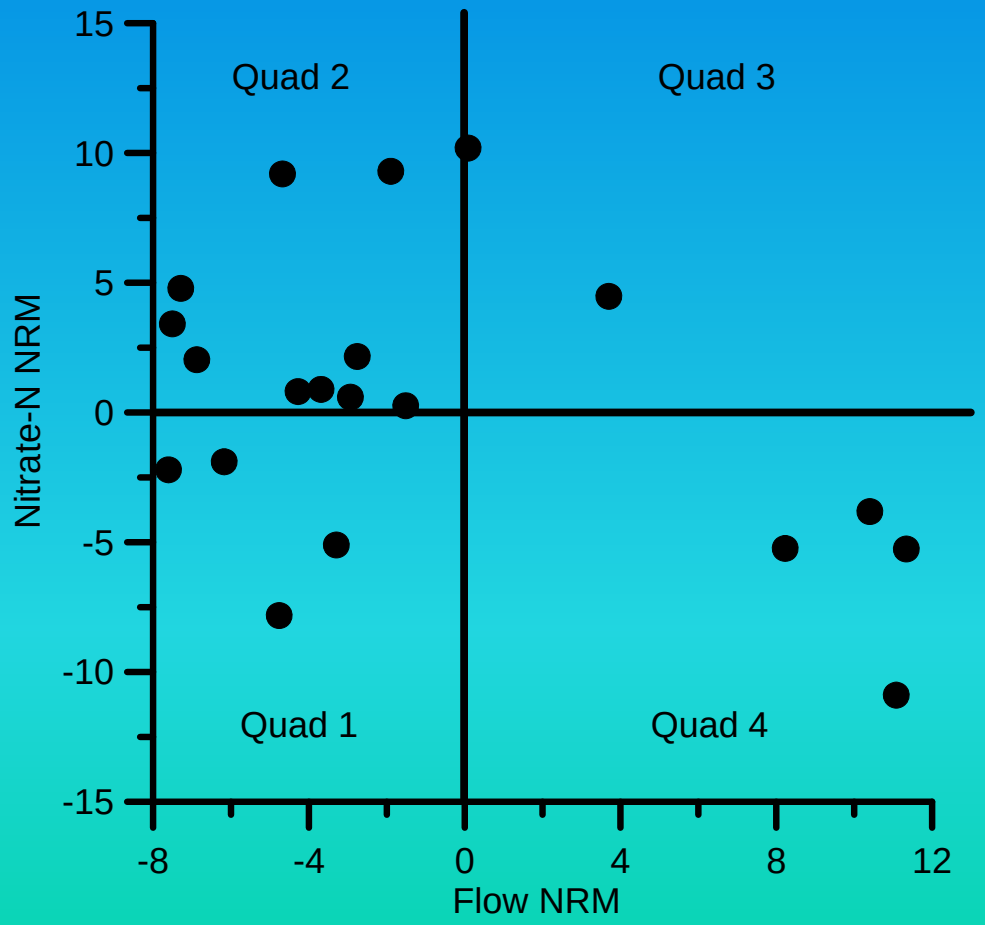
DO TMDL Project

- Integration of multiple WQ parameters in single analysis
- Relativistic analysis
  - Normalized rank means (NRMs)
  - Water quality indexes
    - multiple parameters simultaneously
  - Stoplight analysis



DO TMDL Project

- **Resolving concentration & load conflicts**
  - **Non-normal distribution requires novel approaches**



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EERP & CV-SALTS

- Continue flow & salinity station operations
  - Training & operations
  - Data management & QA
- Alternative management strategies
  - Relative to river water quality
  - Alternatives to permitted discharge approach
  - Load vs. concentration strategies
  - Water quality trading program
- Integration of salt management & other TMDL programs
  - Unintended consequences
  - Real-time reservoirs & water quality

Summary

- **Ecological Engineering Research Program**
  - Focused on water quality issues in Central Valley
  - Expertise & location
  - Successful research record
    - Good relations with collaborating organizations
- **EERP Research with CV-SALTS**
  - Continued data collection
  - Scientific analysis for watershed based management
    - Integration of diverse water quality and TMDL objectives